

PATENT

Attorney Docket No. 67845/JAS
Client Ref. SEA 2797.01

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a counterplate welded to said sleeve and located adjacent said thrust plate to define a second fluid dynamic thrust bearing,
the welded counterplate containing fluid within the thrust bearings and the journal bearing.

Remarks

This amendment is submitted in response to the Office Action of April 20, 2001. Reconsideration and allowance of the claims is respectfully requested.

In this Office Action, the Examiner requests a modified Abstract; this Abstract is submitted on a separate page.

The drawings are objected to for improper use of reference characters. Therefore, amendments have been made to the drawings and the to the specification to eliminate any inconsistencies. At paragraph 5, however, the Examiner indicates that the drawings are objected to as failing to show the journal bearings and thrust bearings. Given the fact that a vertical sectional drawing is being used, it is believed that the use of reference numbers connected with appropriate reference lines drawn to the regions where the thrust bearings and journal bearings are located is adequate to accurately identify and teach a person of skill in the art exactly where these bearings are located. Therefore, claiming of these features is proper.

The Examiner also objected to claim 6 and 7 as lacking clarity. However, claim 6 depends on claim 5 which states that the sleeve and counterplate are fixed to a base; claim 6 states that the shaft supports a hub for rotation. Thus it is clear that the shaft and hub rotate together relative to the sleeve and counterplate combination, and the rejection should be withdrawn.

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Finally, the Examiner rejects all of the claims as anticipated by Oaku. This rejection is respectfully traversed. The Examiner has leapt to the conclusion that the counterplate is welded to the sleeve citing Fig. 1. A careful examination failed to find any such teaching. In fact, a review of Fig. 1 finds that the disclosure therein shows the use of a sealing o-ring 50 fitted in an annular groove 48 of the sleeve 8. It is exactly this structure which is eliminated by the use of the present invention. According to the present invention, by adopting the expedient of welding the thrust plate to the surrounding sleeve, the time, labor and expense of incorporating an o-ring into the sleeve is eliminated. Therefore, the reference cited by the Examiner in fact supports the novelty and unobviousness of the present invention. Therefore, reconsideration and allowance of all claims is respectfully requested.

If any matters can be handled by telephone, Applicant requests that the Examiner telephone Applicant's attorney at the number below.

The Commissioner is authorized to charge any additional fees to Deposit Account No. 20-0782 (Order No. 803279701/JAS).

Respectfully submitted,

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Versions With Markings to Show Changes Made

In the Specification:

Beginning on page 3, paragraph 5, lines 25 – 33 and continuing onto page 4, lines 5 - 15, please make the marked changes:

On page 3, line 33, change “22” to – 10 – .

Referring to FIG. 1, especially the left-hand side thereof, the basic elements of a typical spindle motor includes a fixed shaft 10 which supports for rotation a sleeve 12 having a hub or the like 14 which has a flange 16 capable of supporting one or more disc for rotation thereon. A thrust plate 20 is supported at one end of the shaft, with the hydrodynamic bearing or bearings 22 extending both axially along the surface of the shaft and radially along both surfaces 24, 26 of the thrust plate to enhance the radial and axial stability of the system. The fluid (not shown) of the system is maintained in the reservoir 30 inside the central shaft 10, and circulates over the surfaces and through the gap between the shaft [22] 10 and the sleeve 12 as well as the thrust plate surface 26 and the sleeve 12 and the thrust plate surface 24 and the counterplate 32. In order to prevent any loss of fluid from the gap, it must not be allowed to escape between the upright portion 40 of the sleeve and the facing surface of the counterplate 32. For this reason, the prior art has proposed and utilized a o-ring 42 which rests in a groove 44 in the surface of the sleeve facing the counterplate 32. However, this approach requires both the expense of forming the groove 44 in the sleeve, as well as the cost of the o-ring 42 and the equipment time to insert the o-ring 42 in the groove. Further, in order to maintain the compression of the o-ring and diminish the possibility of fluid escaping, in addition to the counterplate facing the o-ring, a further washer 50 must be used and held in plate against the counterplate.

Beginning on page 4, paragraph 5, lines 25 – 33 and continuing onto page 5, lines 5 - 18, please make these marked changes:

On page 4, line 28, please change “104” to – 103 – .

On page 5, line 16, please add “150” after the word “weld”.

On page 5, line 16, please delete “thrust plate” and replace with – counterplate – .

FIG. 2 shows a design which in contrast to FIG. 1 is a rotating shaft 100 as the shaft is integrated with the hub 102 which carries flange 104 which functions as a disc support surface. The shaft with the hub 102 supports a magnet 103 on its inner axial surface, facing stator 106 whose energization causes stable rotation of the hub. The stator in turn is supported on a axial extension 108 of base casting 110. A sleeve 112 which supports the shaft 100 and its associated thrust plate 116 is incorporated into the axial extension 108 of the base 110. This sleeve 112 has axial surface 120 that faces a surface of the shaft. These two surfaces define a journal bearing which is of standard design and not further shown. Further, the thrust plate at surfaces 122 and 124 define in cooperation with the sleeve 112 and the counterplate 130 thrust bearings of the fluid dynamic type which further support the shaft against both axial and radial forces. Each of these journals and thrust bearings require fluid in the gap between the facing surfaces. This fluid may either recirculate through an internal channel 134 which either passes through the thrust plate or between the thrust plate and shaft, or return through a central reservoir or the like such as the reservoir 30 shown in FIG. 1. In either case, a primary cause for concern is with the old design of FIG. 1 is to prevent the escape of any fluid between the surface 140 of the sleeve and the complementary surface 142 of the thrust plate. To avoid this loss, while enhancing the simplicity of the design, a laser weld 150 has been applied at the junction at the axially outer edge of the [thrust plate] counterplate 130 and the sleeve 112. This laser weld is applied using well-known techniques and technology but by its very simplicity enhances the reliability.

In the Abstract of the Disclosure:

Please make the marked additions:

A cartridge or motor which includes a shaft with a thrust plate at one end; the shaft is supported for rotation by a journal bearing along the shaft and thrust bearings on either side of a thrust plate, and fluid which provides the bearing surface; the counterplate which lies across the end of the shaft is welded to an extension of the sleeve in which the counterplate is fit to prevent fluid loss.



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TC 2800 MAIL ROOM

In the Claims:

Claim 1 has been amended as follows:

(Amended) 1. A spindle motor for use in a disc drive comprising
a shaft supporting a thrust plate at one end thereof,
a sleeve surrounding the shaft and adjacent the thrust plate and cooperating with the shaft
to define a journal bearing and the thrust plate to define a first fluid thrust bearing,
a counterplate welded to [upraised axial arms of] said sleeve and located adjacent said
thrust plate to define a second fluid dynamic thrust bearing,
the welded counterplate containing fluid within the thrust bearings and the journal
bearing.